

Fig.1

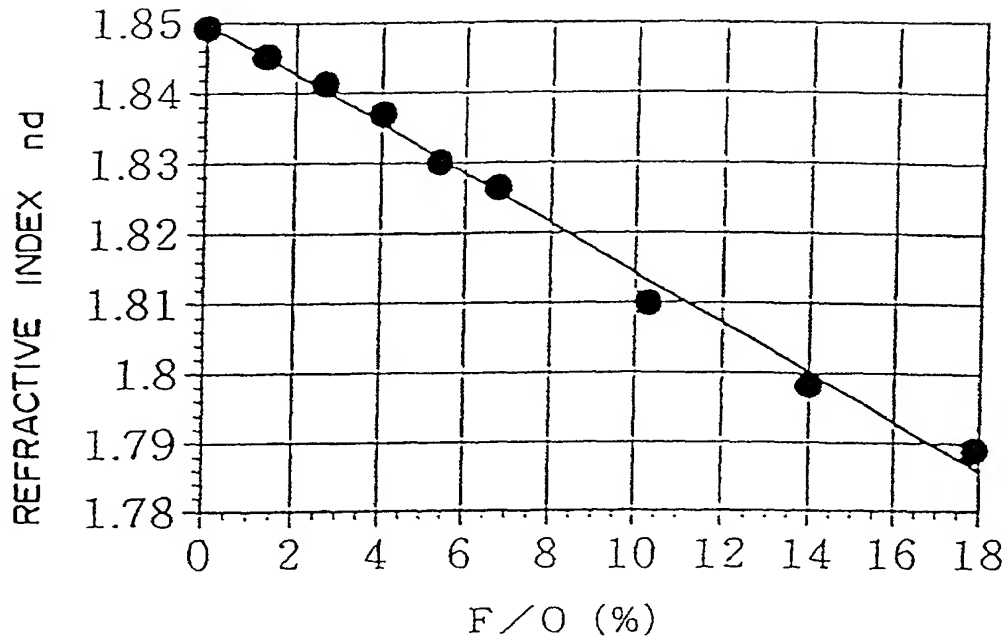


Fig.2

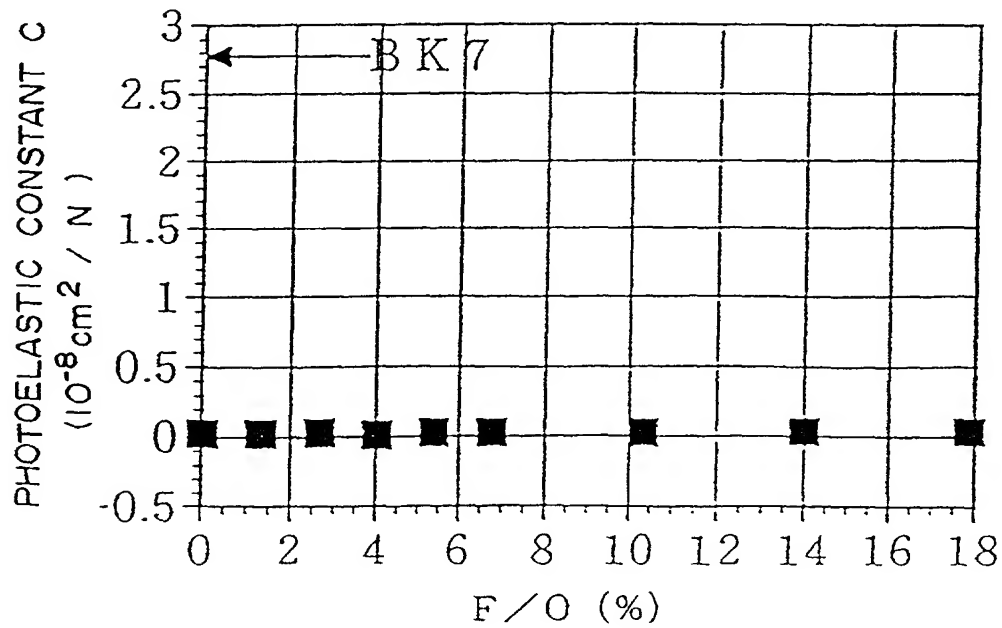
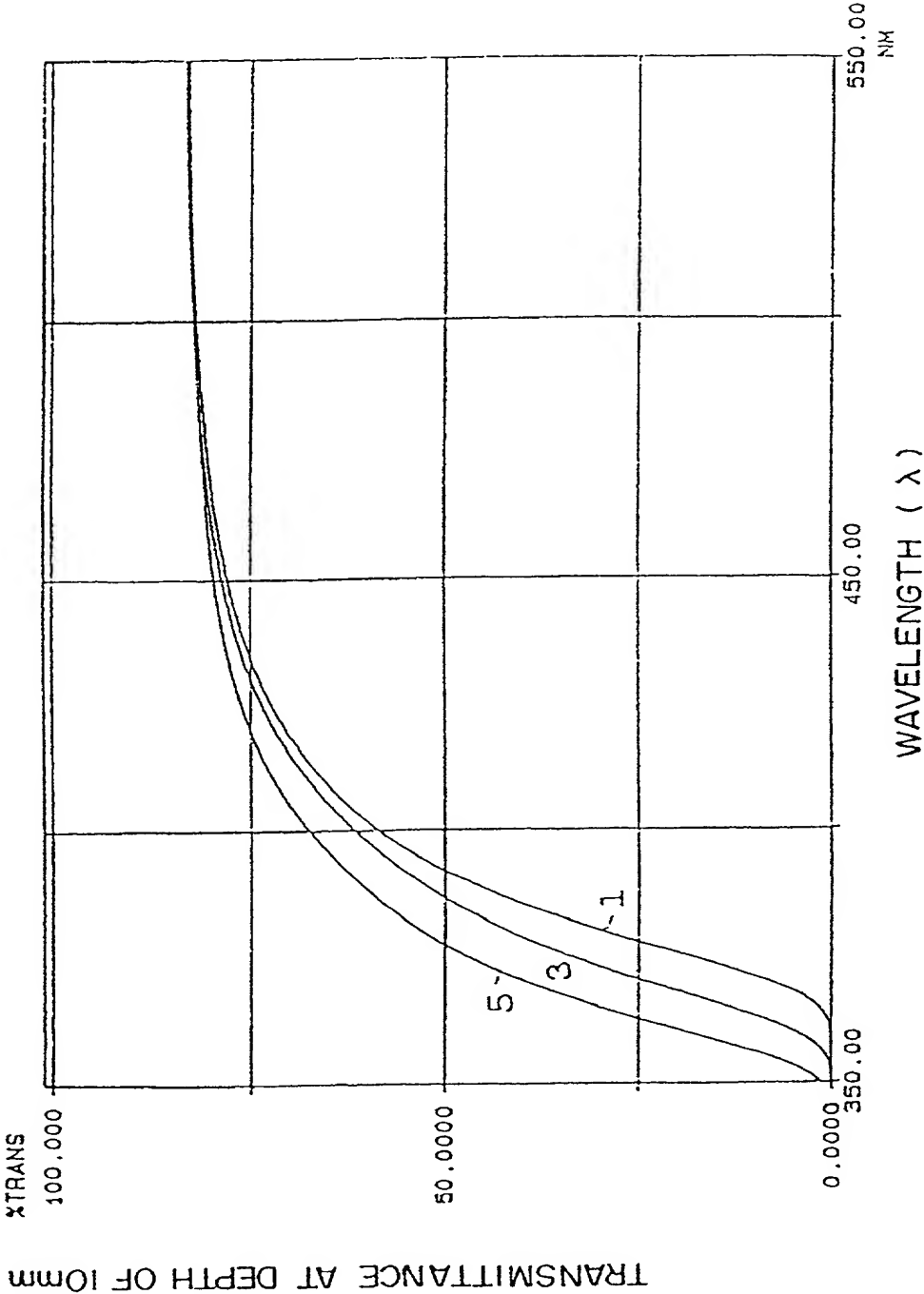


Fig.3



Sheet 3 of 29

Fig.4

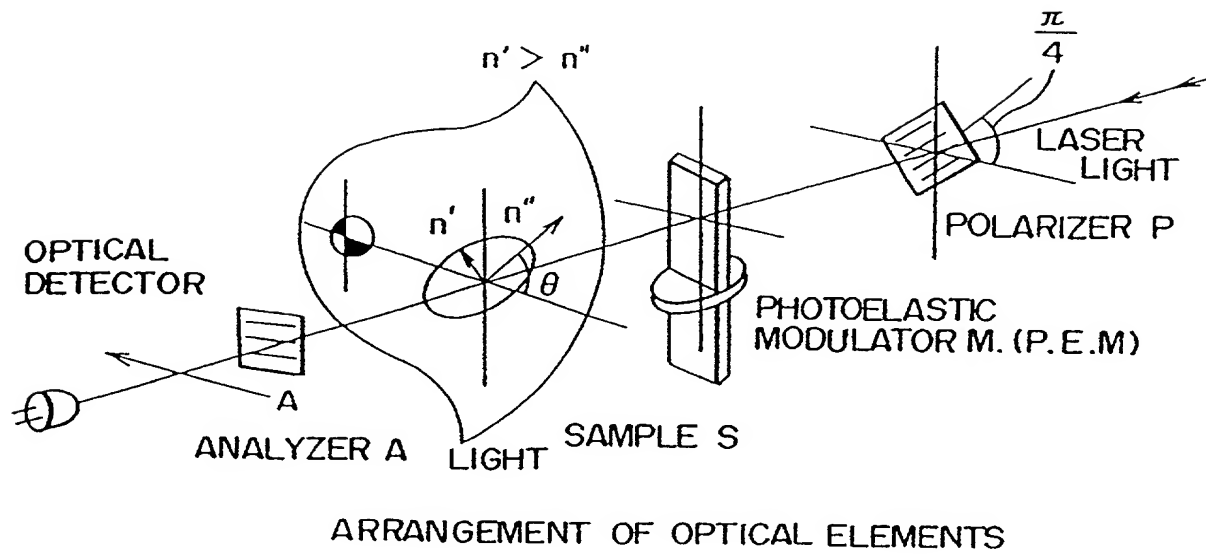


Fig.5

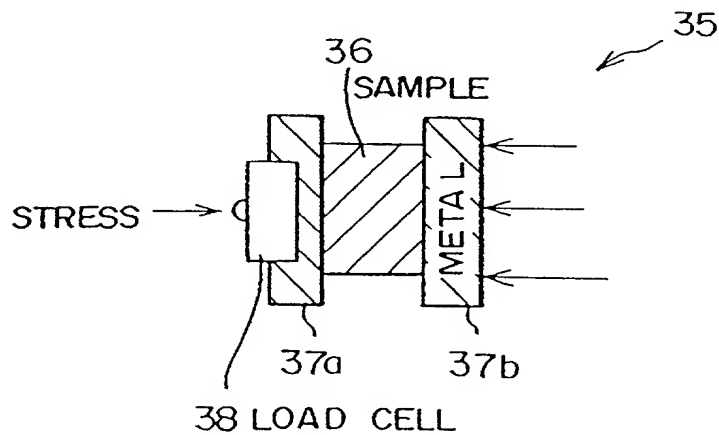


Fig.6

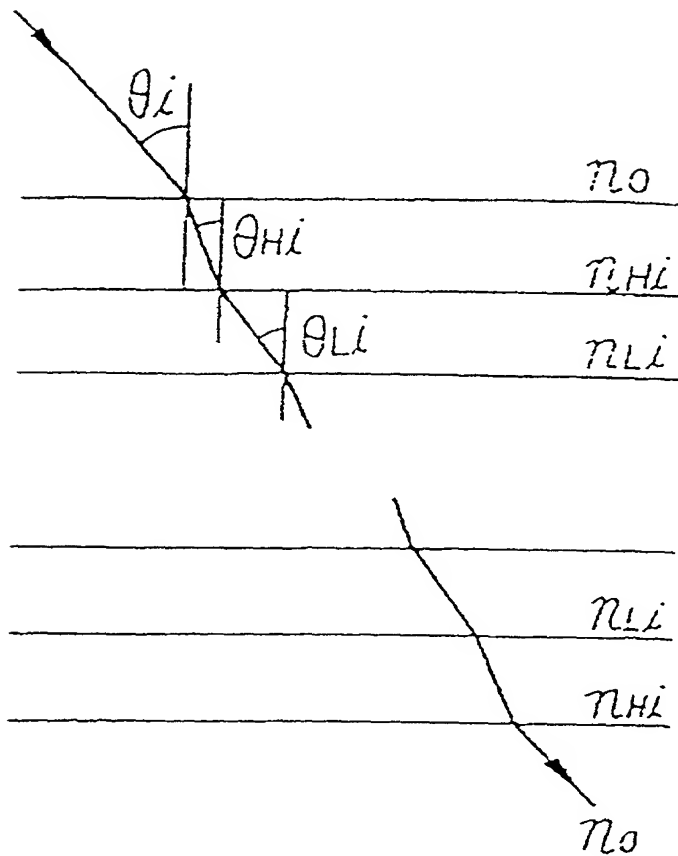


Fig.7

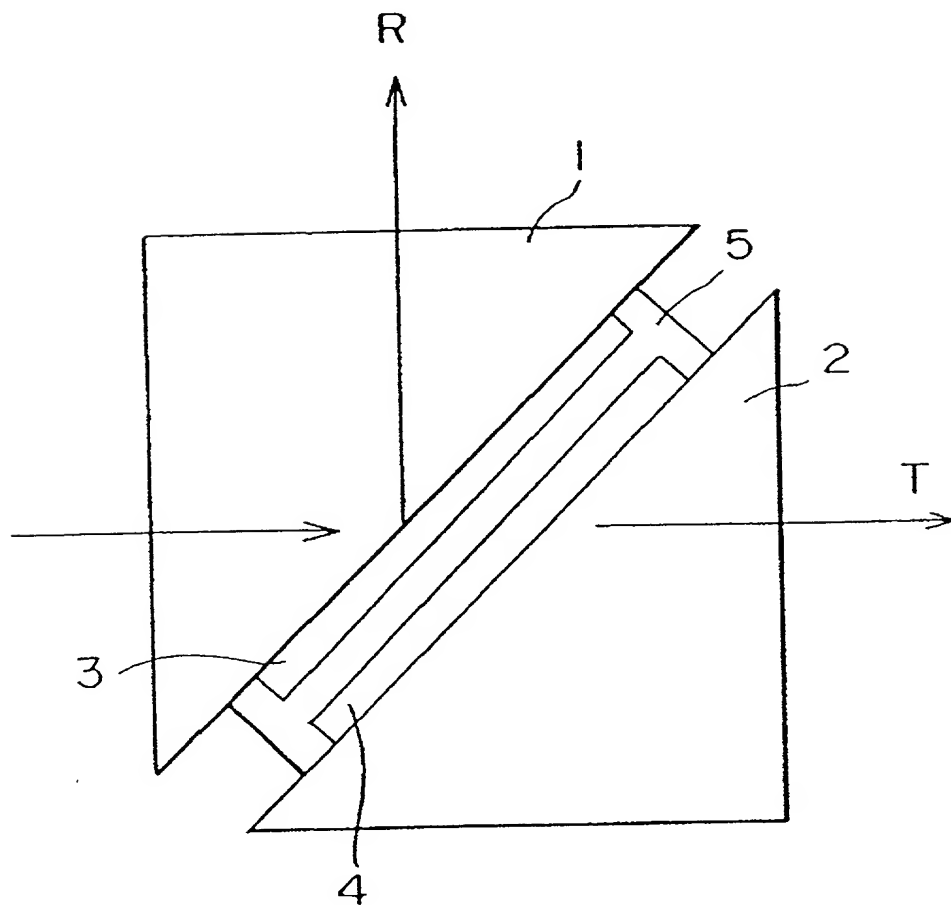


Fig.8

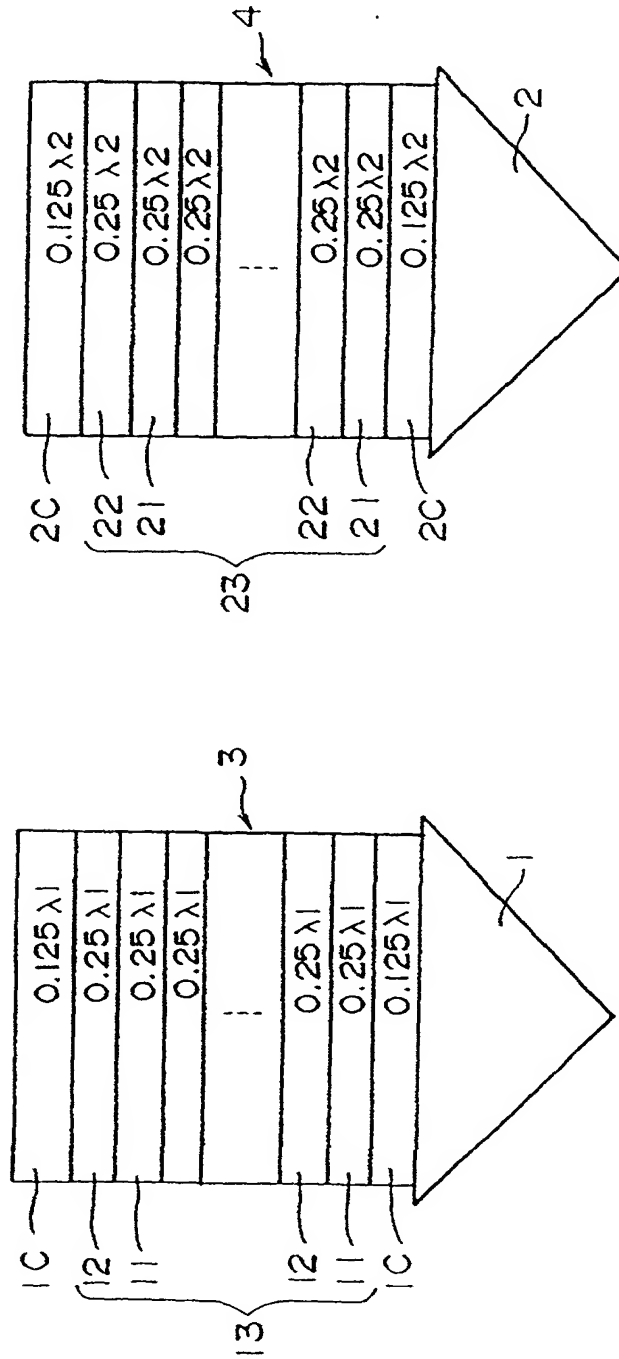


Fig.9

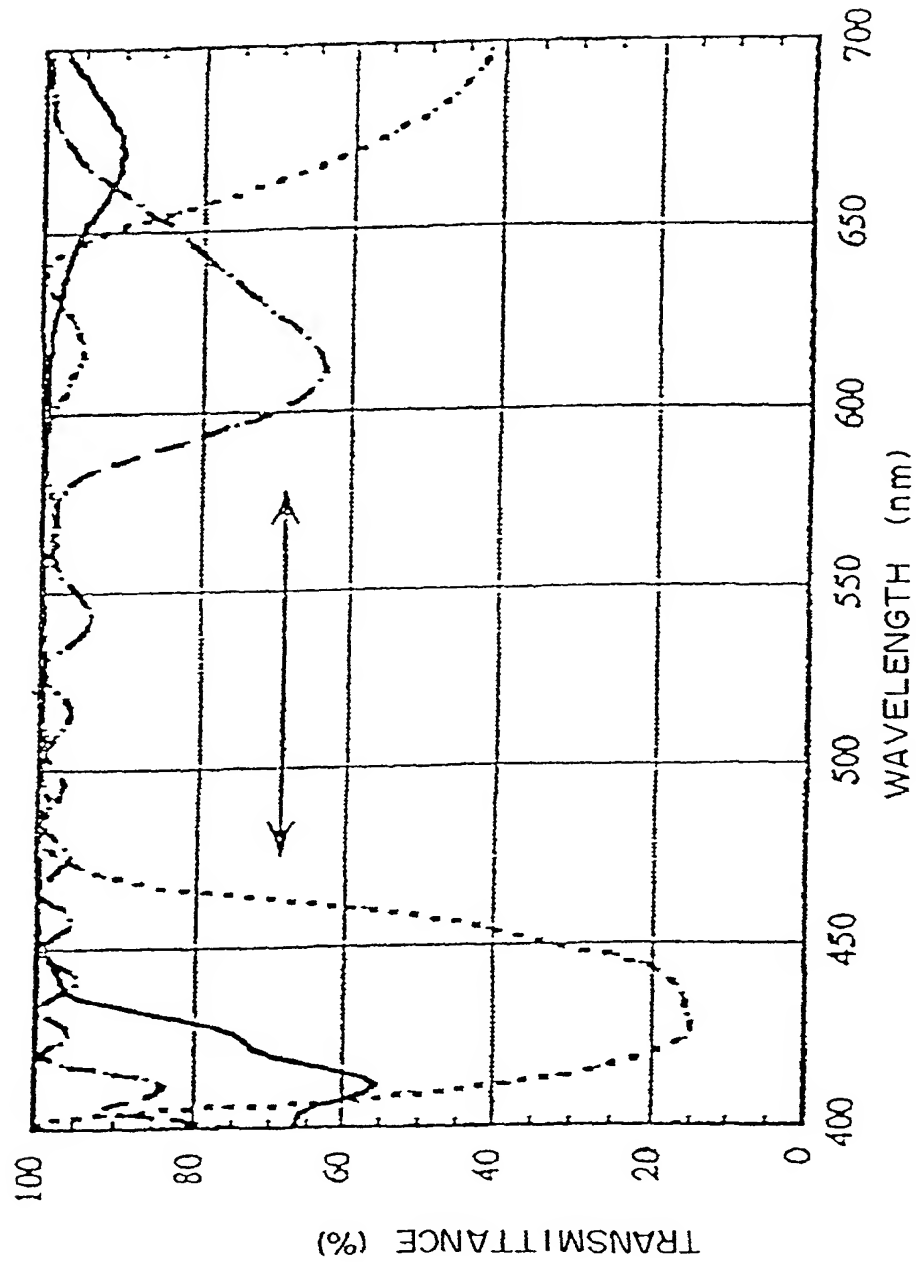


Fig.10

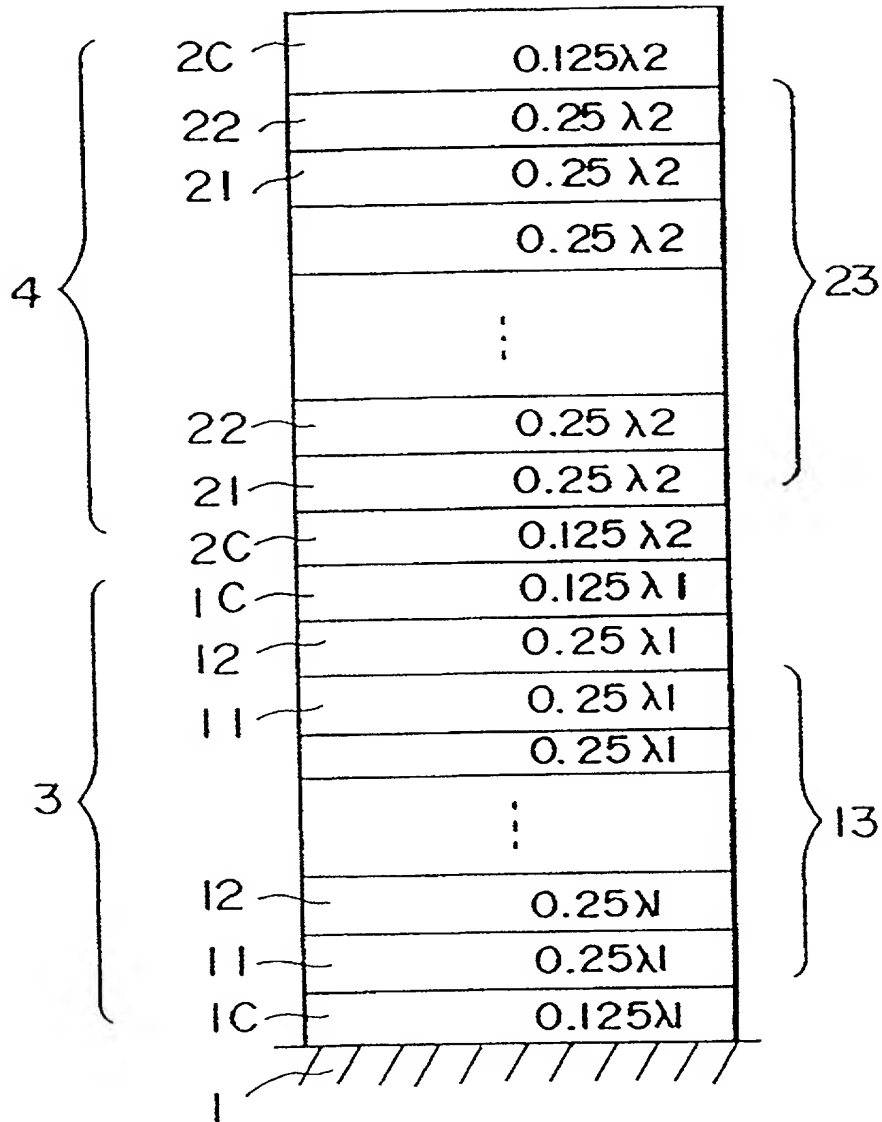


Fig.11

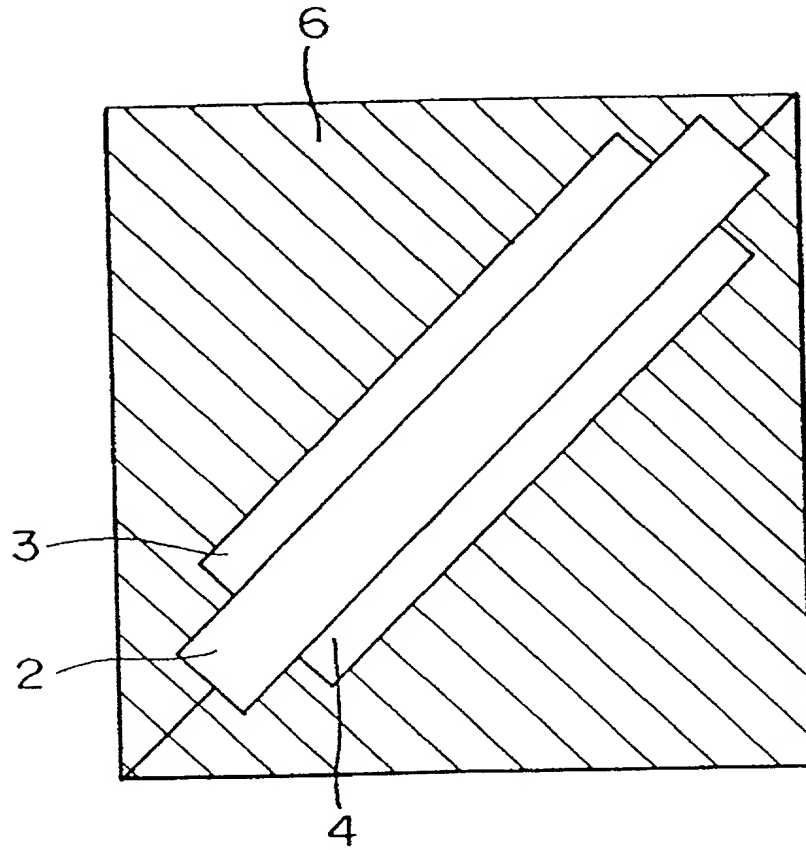


Fig.12

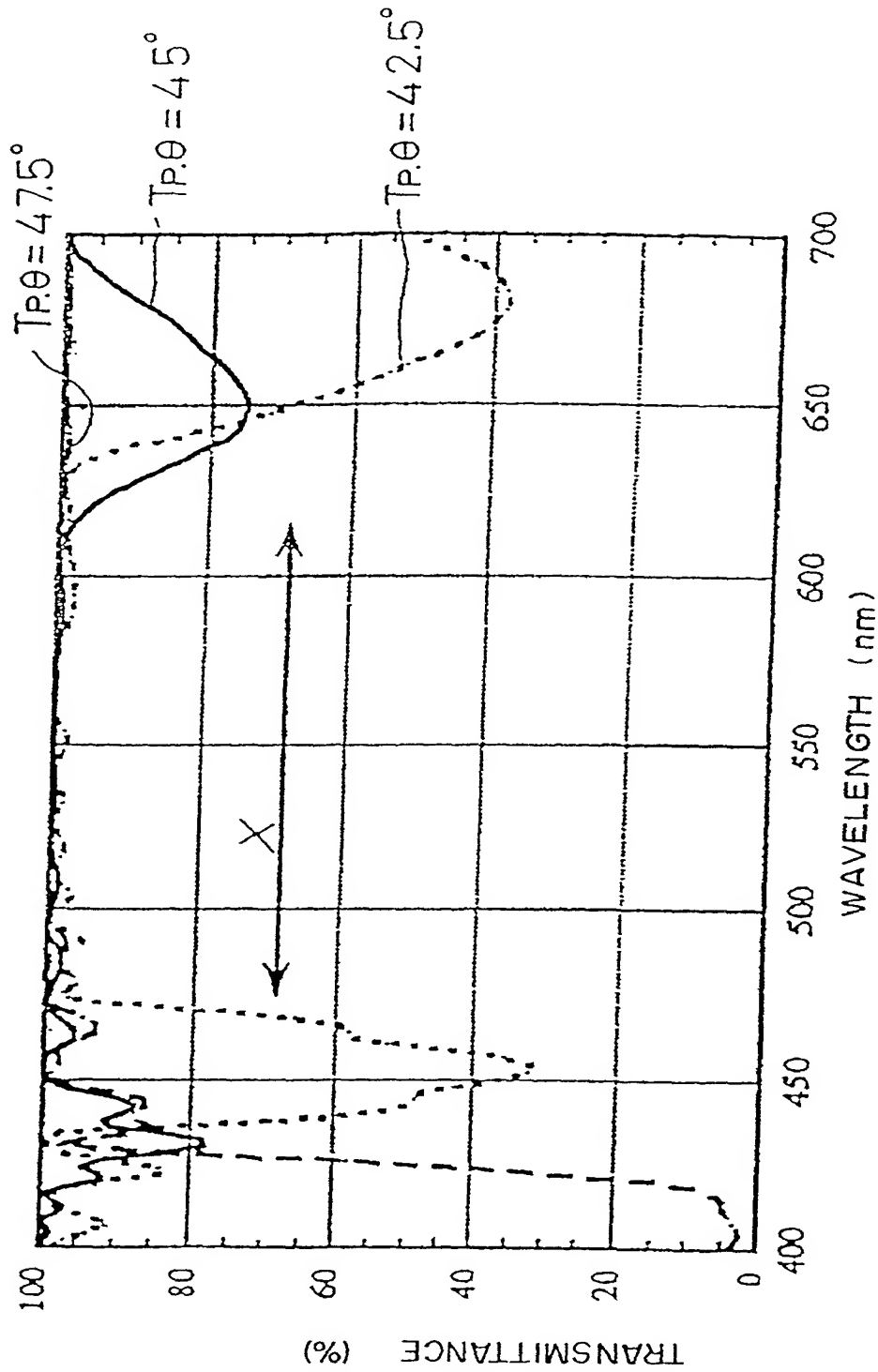


Fig.13

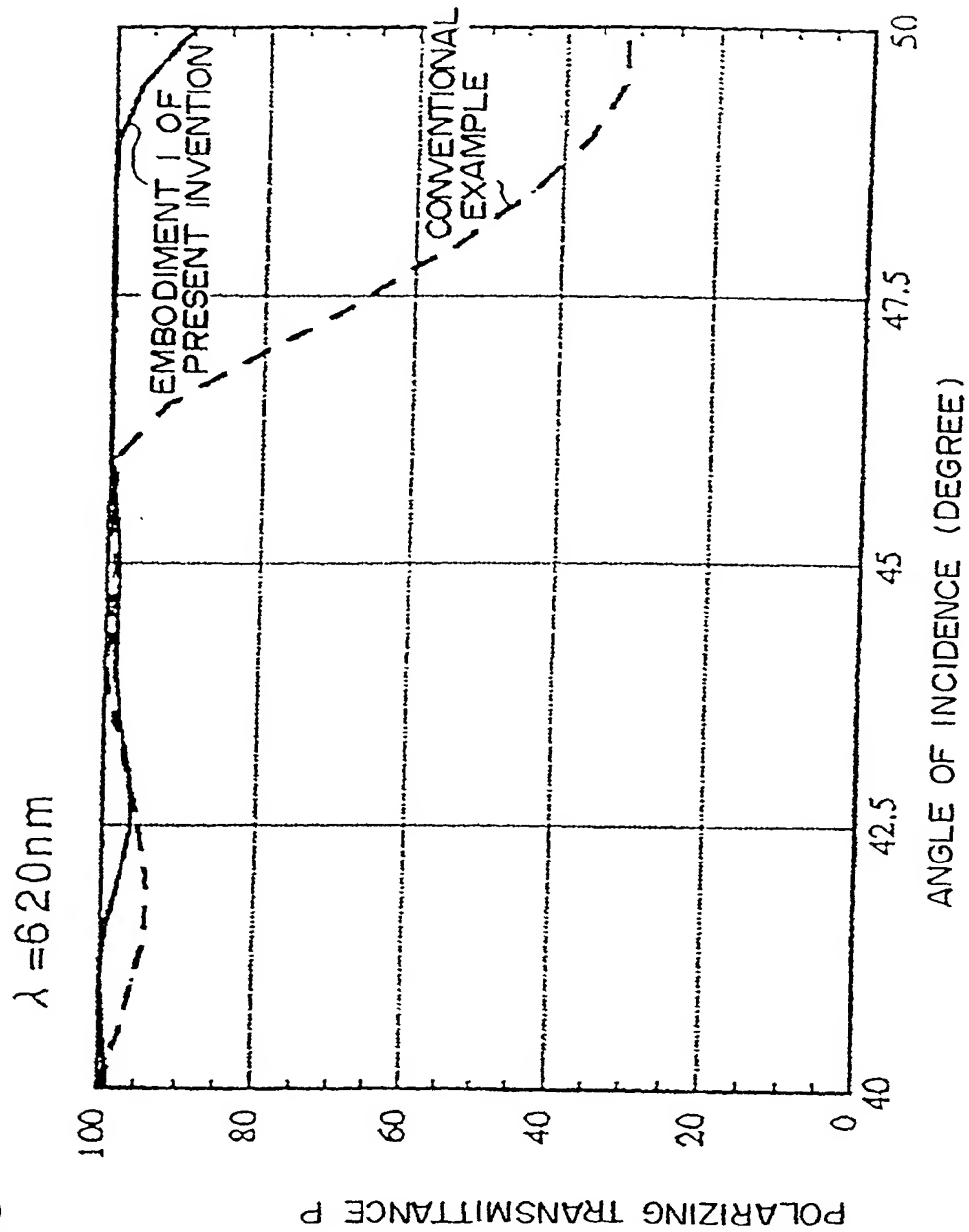


Fig.14

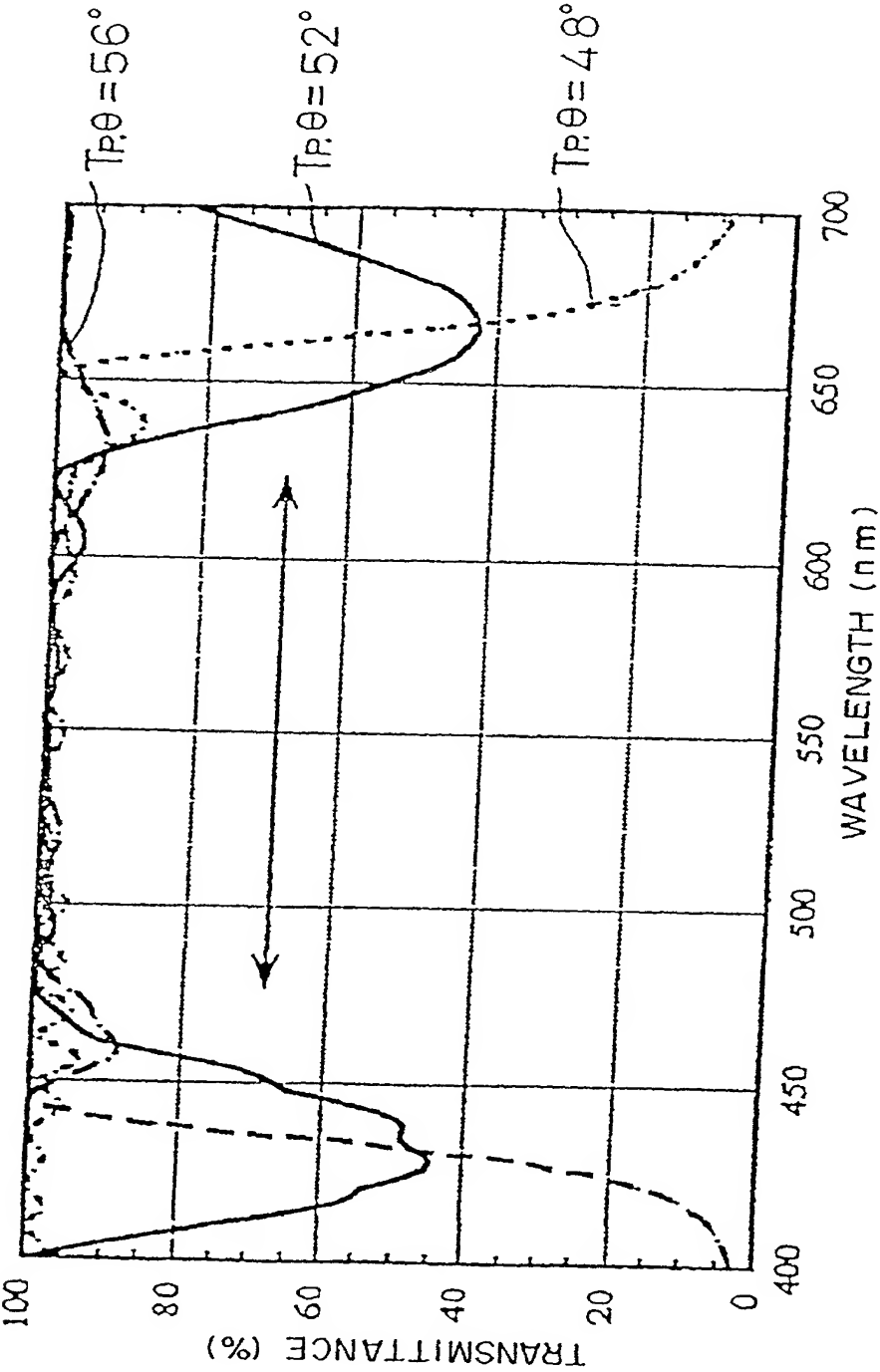


Fig.15

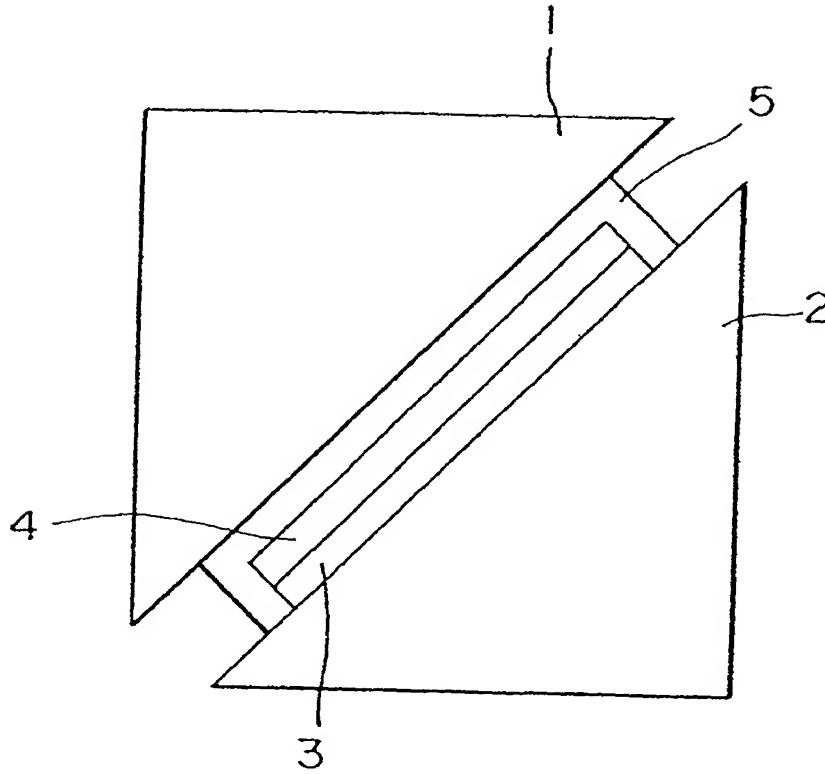


Fig.16
(Table 1)

LIST OF EXAMPLES (mol%, wt%)

No.	1		2		3		4	
	mol%	wt%	mol%	wt%	mol%	wt%	mol%	wt%
SiO ₂	52.7	23.9	52.7	23.8	52.7	23.8	52.7	23.8
Na ₂ O	1.9	0.9	1.9	0.9	1.9	0.9	1.9	0.9
K ₂ O	1.3	0.9	1.3	0.9	1.3	0.9	1.3	0.9
PbO	43.9	74.0	42.9	72.2	41.9	70.4	40.9	68.6
PbF ₂	—	—	1.0	1.9	2.0	3.7	3.0	5.5
Sb ₂ O ₃	0.2	0.3	0.2	0.3	0.2	0.3	0.2	0.3
K ₂ SiF ₆	—	—	—	—	—	—	—	—
F/O (%)	—		1.31		2.65		4.00	
PHOTOELASTIC CONSTANT (10 ⁻⁸ cm ² /N)	+0.02		+0.02		+0.03		+0.01	
REFRACTIVE INDEX n _d	1.849		1.845		1.841		1.837	
WAVELENGTH CORR. TO TRANSMITTANCE OF 80% (nm)	416		411		408		404	

Fig.17
(Table 2)

LIST OF EXAMPLES (mol%, wt%)

No.	5		6		7		8	
	mol%	wt%	mol%	wt%	mol%	wt%	mol%	wt%
SiO ₂	52.7	23.8	52.7	23.7	52.7	23.6	52.7	23.5
Na ₂ O	1.9	0.9	1.9	0.9	1.9	0.9	1.9	0.9
K ₂ O	1.3	0.9	1.3	0.9	1.3	0.9	1.3	0.9
PbO	39.9	66.8	38.9	65.0	36.4	60.6	33.9	56.2
PbF ₂	4.0	7.3	5.0	9.2	7.5	13.7	10.0	18.2
Sb ₂ O ₃	0.2	0.3	0.2	0.3	0.2	0.3	0.2	0.3
K ₂ SiF ₆	—	—	—	—	—	—	—	—
F/O (%)	5.37		6.75		10.30		13.98	
PHOTOELASTIC CONSTANT (10 ⁻⁸ cm ² /N)	+0.03		+0.03		+0.03		+0.04	
REFRACTIVE INDEX n _d	1.830		1.826		1.810		1.798	
WAVELENGTH CORR. TO TRANSMITTANCE OF 80% (nm)	399		394		391		388	

Fig.18
(Table 3)

LIST OF EXAMPLES (mol%, wt%)

No.	9		10		11		12	
	mol%	wt%	mol%	wt%	mol%	wt%	mol%	wt%
SiO ₂	52.1	23.2	52.1	22.9	52.1	22.9	45.7	19.0
Na ₂ O	2.0	0.9	2.0	0.9	2.0	0.9	2.0	0.9
K ₂ O	—	—	—	—	—	—	2.0	1.3
PbO	44.3	73.2	38.2	62.5	35.7	58.1	45.5	70.4
PbF ₂	0.2	0.3	6.3	11.3	8.8	15.7	—	—
Sb ₂ O ₃	0.1	0.3	0.1	0.3	0.1	0.3	1.5	3.1
K ₂ SiF ₆	1.3	2.1	1.3	2.1	1.3	2.1	3.3	5.3
F/O (%)	5.44		14.10		17.86		13.62	
PHOTOELASTIC CONSTANT (10 ⁻⁸ cm ² /N)	+0.03		+0.04		+0.04		+0.03	
REFRACTIVE INDEX n _d	1.830		1.798		1.789		1.810	
WAVELENGTH CORR. TO TRANSMITTANCE OF 80% (nm)	398		386		380		390	

Fig.19
(Table 4)

LIST OF EXAMPLES (mol%, wt%)

No.	1 3		1 4	
	mol%	wt%	mol%	wt%
SiO ₂	45.2	19.8	40.0	17.5
Na ₂ O	5.1	2.3	0.5	0.2
K ₂ O	3.8	2.6	—	—
KF	—	—	15.6	10.7
PbO	40.3	65.4	41.4	67.5
PbF ₂	4.2	7.5	2.5	4.1
Sb ₂ O ₃	0.1	0.3	—	—
K ₂ SiF ₆	1.3	2.1	—	—
F/O (%)	11.58		16.90	
PHOTOELASTIC CONSTANT (10 ⁻⁸ cm ² /N)	+0.04		+0.04	
REFRACTIVE INDEX n _d	1.814		1.748	
WAVELENGTH CORR. TO TRANSMITTANCE OF 80% (nm)	410		396	

Fig.20
(Table 5)

No.	2 1	2 2	2 3	2 4
REFRACTIVE INDEX	1.8223	1.8301	1.8360	1.8426
	2 5	2 6	2 7	B K 7
	1.8501	1.8570	1.8637	1.5168

Fig.21
(Table 6)

N o.	2 2	2 5	B K 7
STRESS (N/cm ²)	3 1 . 5	3 1 . 0	3 0 . 0
DEGREE OF BIREFRINGENCE (nm/cm)	9 . 4 5	0 . 3 1	8 3 . 4

Fig.22

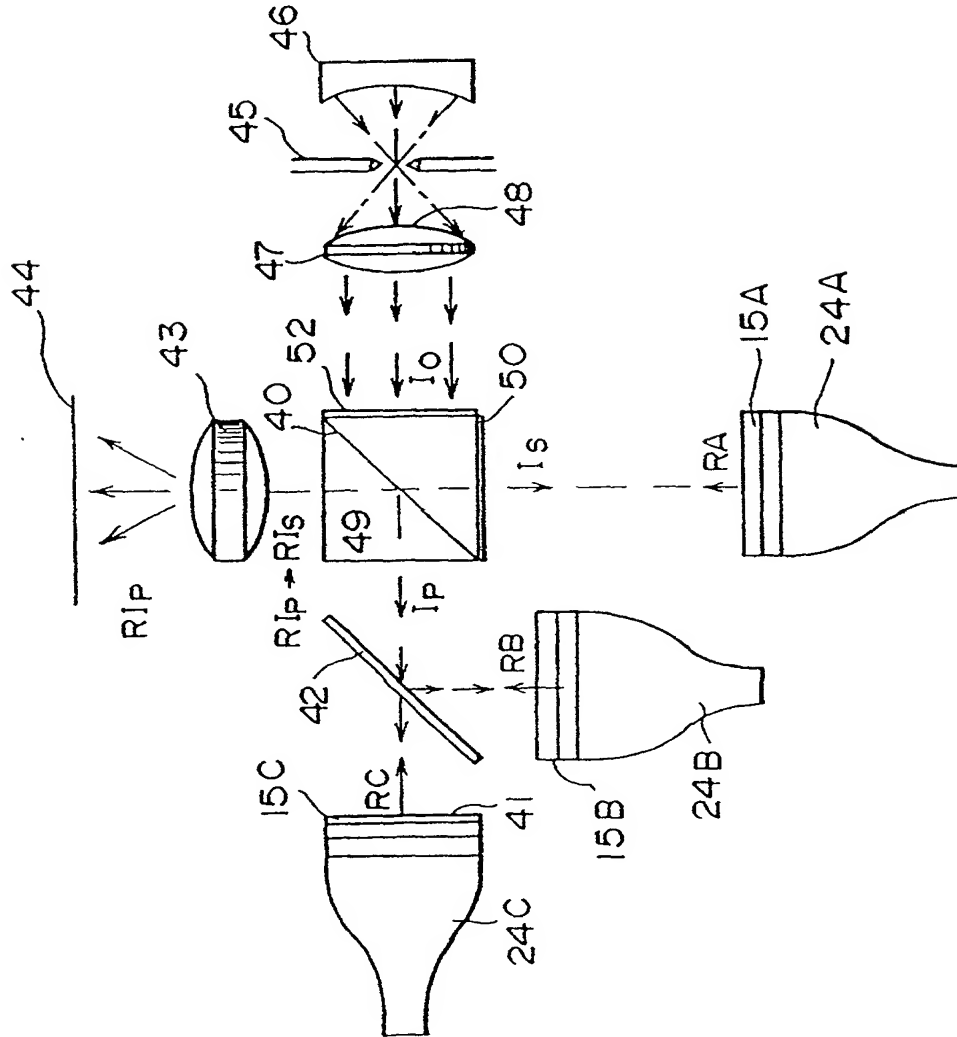
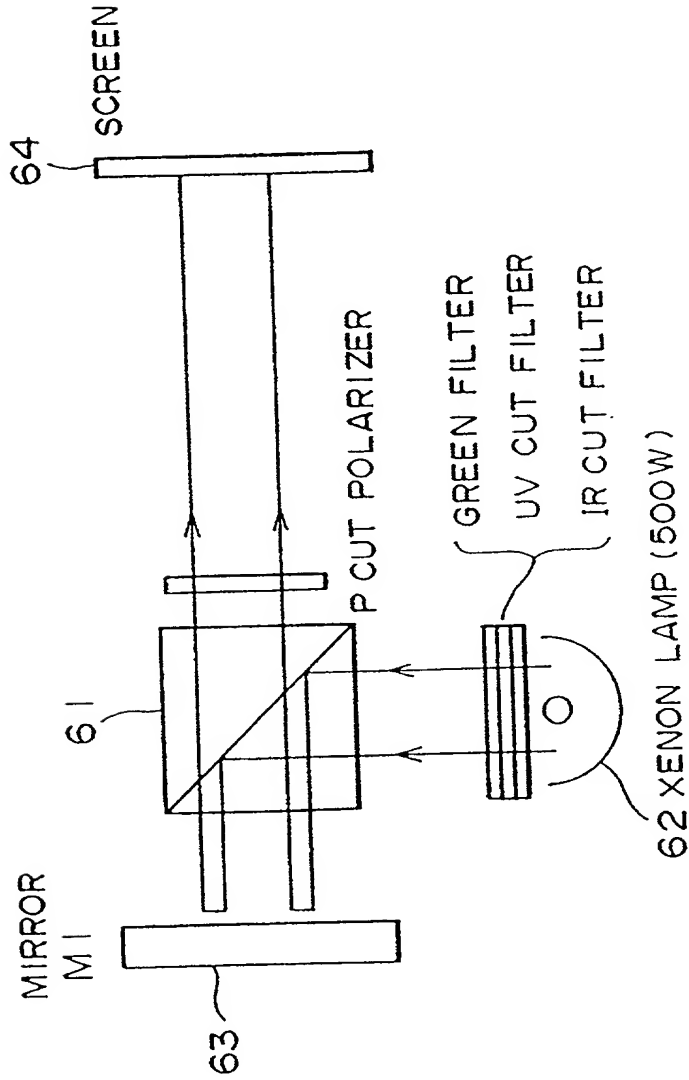


Fig. 23



EXTINCTION RATIO

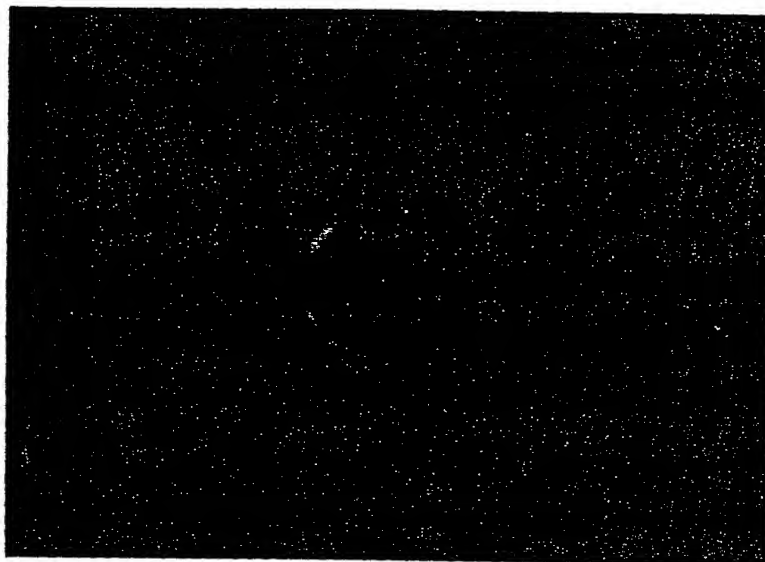
AVERAGE DATA WITH THE WAVELENGTH OF 480-610 nm AND

THE INCIDENT ANGLE OF $\theta_0, +6, -6$ DEGREES

TRANSMISSION : $T_P > 80\%$, $T_S \leq 0.02\%$ EXT. RATIO > 4000

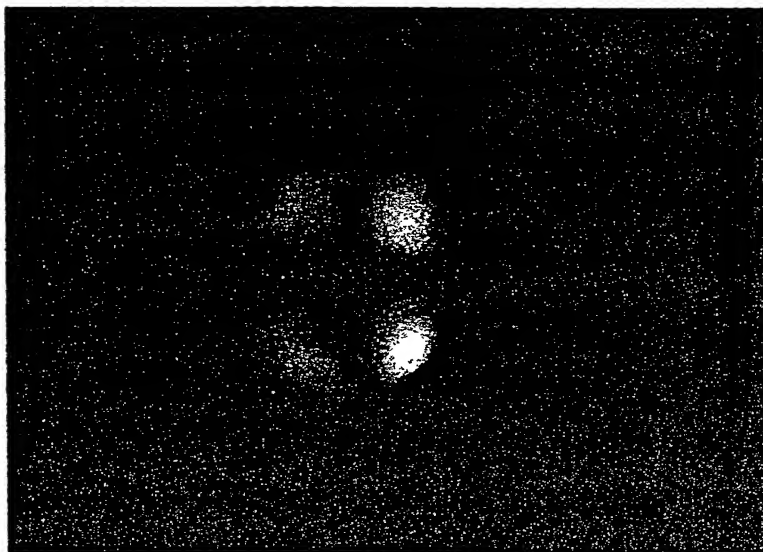
REFLECTION : $R_S > 80\%$, $R_P \leq 4\%$ EXT. RATIO > 20

Fig.24



NEW P B S (DISCERNIBLE SHAPE IS GHOST IMAGE)

Fig.25



CONVENTIONAL - TYPE P B S

Fig.26
(Table 7)

LIST OF EXAMPLES (wt %)

No.	2 1	2 2	2 3	2 4
SiO ₂	2 5. 9	2 5. 4	2 4. 9	2 4. 4
B ₂ O ₃	—	—	—	—
Na ₂ O	0. 9	0. 9	0. 9	0. 9
K ₂ O	0. 9	0. 9	0. 9	0. 9
BaO	—	—	—	—
PbO	7 2. 0	7 2. 5	7 3. 0	7 3. 5
As ₂ O ₃	—	—	—	—
Sb ₂ O ₃	0. 3	0. 3	0. 3	0. 3
PHOTOELASTIC CONSTANT (10 ⁻⁸ cm ² /N)	0. 4 1	0. 3 0	0. 2 2	0. 1 0
LINEAR EXPANSION COEFFICIENT (10 ⁻⁷ /K ⁻¹)	8 8	9 0	9 1	9 1

Fig.27
(Table 8)

LIST OF EXAMPLES (wt%) cont.

番 号	2 5	2 6	2 7	B K 7
S i O ₂	2 3. 9	2 3. 4	2 2. 9	6 8. 9
B ₂ O ₃	—	—	—	1 0. 1
N a ₂ O	0. 9	0. 9	0. 9	8. 8
K ₂ O	0. 9	0. 9	0. 9	8. 4
B a O	—	—	—	2. 8
P b O	7 4. 0	7 4. 5	7 5. 0	—
A s ₂ O ₃	—	—	—	1. 0
S b ₂ O ₃	0. 3	0. 3	0. 3	—
PHOTOELASTIC CONSTANT (10 ⁻⁸ cm ² /N)	0. 0 1	— 0. 0 7	— 0. 1 2	2. 7 8
LINEAR EXPANSION COEFFICIENT (10 ⁻⁷ /K ⁻¹)	9 3	9 3	9 4	8 3

Fig.28

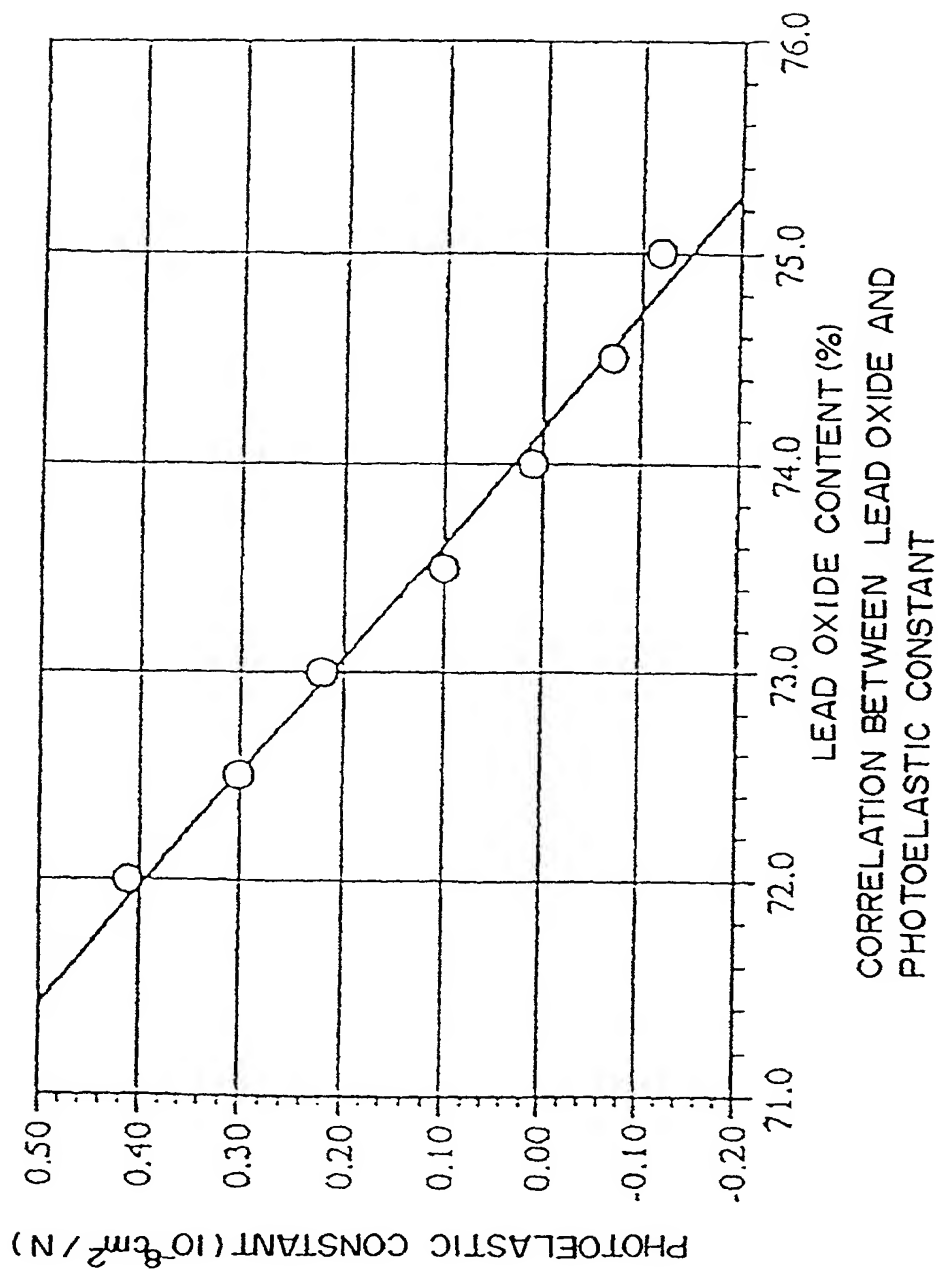


Fig. 29

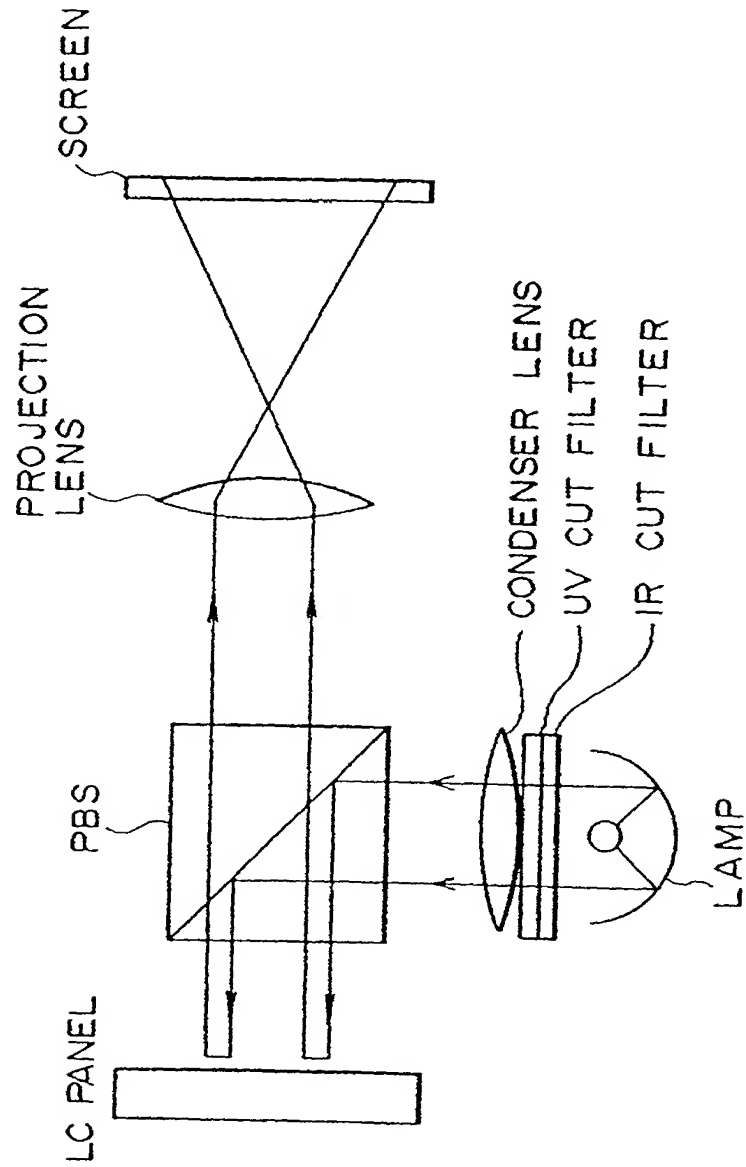


Fig.30
(Table 9)

No.	A※	B	C
SiO ₂	24.9	24.9	24.9
Na ₂ O	0.9	0.9	0.9
K ₂ O	0.9	0.9	0.9
PbO	73.0	73.0	73.0
As ₂ O ₃	—	0.3	—
Sb ₂ O ₃	0.3	—	—
PHOTOELASTIC CONSTANT (10 ⁻⁸ cm ² /N)	0.22	0.22	0.23
WAVELENGTH CORR.TO TRANSMITTANCE OF 80%(nm)	393	396	424
INTERNAL TRANSMITTANCE AT 400nm	86	83	64

※This is the same as the optical glass No.23 indicated in Fig.26 (Table 7).

Fig.31

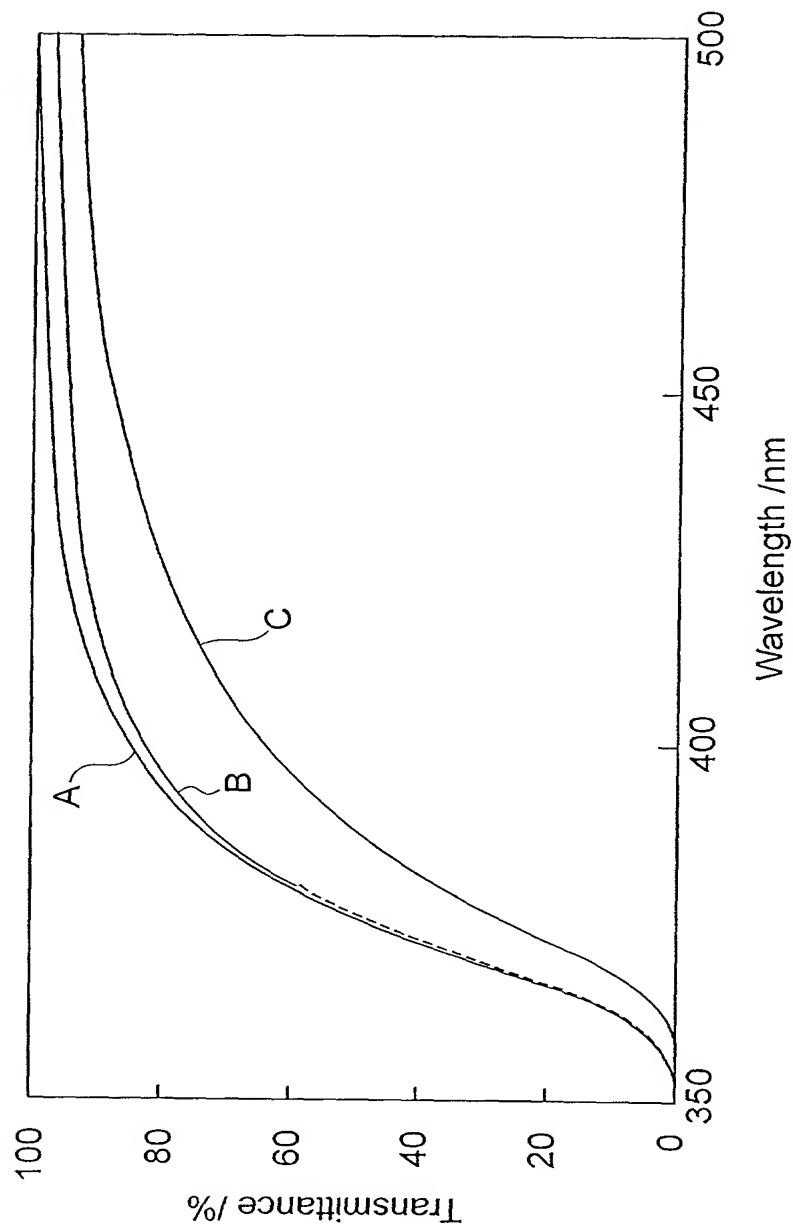


Fig.32
(Table 10)

Results of measurement of photoelastic constants

Glasses	Present *1 invention	PDC6	BK7	DC5	LAC8	FC3
Manufacturer	Nikon	Nikon	Nikon	Nikon	Nikon	Nikon
Refractive index(nd)	1.837	1.5932	1.5168	1.5891	1.7130	1.4645
Abbe's number(ν d)	26.0	67.9	64.1	61.1	53.9	65.8
Photoelastic constant ($10^{-8}\text{cm}^2/\text{N}$)	0.01	0.52	2.85	2.29	1.98	4.09
Main *2 components	$\text{SiO}_2 \cdot \text{R}_2\text{O} \cdot$ $\text{PbO} \cdot \text{PbF}_2$	$\text{P}_2\text{O}_5 \cdot \text{AlF}_3 \cdot$ $\text{RF}_2 \cdot \text{XF}_3$	$\text{SiO}_2 \cdot \text{Al}_2\text{O}_3 \cdot$ $\text{R}_2\text{O} \cdot \text{RO}$	$\text{SiO}_2 \cdot \text{B}_2\text{O}_3 \cdot$ $\text{Al}_2\text{O}_3 \cdot \text{RO}$	$\text{B}_2\text{O}_3 \cdot \text{Al}_2\text{O}_3 \cdot$ $\text{RO} \cdot \text{X}_2\text{O}_3$	$\text{SiO}_2 \cdot \text{B}_2\text{O}_3 \cdot$ $\text{Al}_2\text{O}_3 \cdot \text{KF}$
Glasses	FK5	SK16	F2	ZKN7	SF2	SF6
Manufacturer	Schott	Schott	Schott	Schott	Schott	Schott
Refractive index(nd)	1.4875	1.6204	1.6200	1.5085	1.6477	1.8052
Abbe's number(ν d)	70.4	60.3	36.4	61.2	33.9	25.4
Photoelastic constant ($10^{-8}\text{cm}^2/\text{N}$)	2.92	1.90	2.81	3.64	2.64	0.64

* 1: This is the same as the optical glass No.4 indicated in Fig.16 (Table 1).

* 2: "R" denotes an alkaline metal or an alkaline earth metal.

"X" denotes a rare earth metal.